IN THE CLAIMS

This listing of claims will replace all prior versions, and listings, of claims in the application:

Claims 1-9 (Cancelled)

10. (Currently Amended) ~~The method of claim 9, including the step of:~~ A method of data transmission and reception over a transmission channel at high spectral efficiency, comprising steps of:

segmenting the transmission channel into a plurality of sub channels;

allocating bits of the data transmission to the sub channels based on the existing noise distribution;

segmenting of bits in each of the sub channels to orthogonal prolate pulses;

generating symbols from the prolate pulses and modulating the symbols;

transmitting the symbols in a transmission channel connected to a receiving mechanism;

demodulating received signals of each sub channel at the receiving mechanism;

filtering the demodulated symbols to recover transmitted symbols;

recreating an original data signal by mapping the recovered symbols into bits;

reconstructing the originally transmitted data from the mapped bits; and

constructing the data transmission to be transmitted over [[a]] the transmission channel with a form according to

$$x_i(t) = \sum_{k=-\infty}^{\infty} I_k p_i(t - kT);$$

where I_k is a k^{th} alphabet, $p_i(t-kT)$ is a function, kT is a time interval, t is a time variable and $x_i(t)$ is a summation of the pulses.

11. (Currently Amended) The method of claim 10, including the step of:

constructing the data transmission to be transmitted over [[a]] the transmission channel within a form according to

$$y_i(t) = \sum_{k=-\infty}^{\infty} Q_k p_i(t - kT);$$

where Q_k is a k^{th} alphabet, $p_i(t-kT)$ is a function, kT is a time interval, t is a time variable and $y_i(t)$ is a summation of the pulses.

12. (Cancelled)

13. (Currently Amended) ~~The method of claim 13, including the step of:~~ A method of data transmission and reception over a transmission channel at high spectral efficiency, comprising steps of:

segmenting the transmission channel into a plurality of sub channels;

allocating bits of the data transmission to the sub channels based on the existing noise distribution;

segmenting of bits in each of the sub channels to orthogonal prolate pulses;

generating symbols from the prolate pulses and modulating the symbols;

transmitting the symbols in a transmission channel connected to a receiving mechanism;

demodulating received signals of each sub channel at the receiving mechanism;

filtering the demodulated symbols to recover transmitted symbols;

recreating an original data signal by mapping the recovered symbols into bits;

reconstructing the originally transmitted data from the mapped bits;

allocating bits includes inserting signal data into bins bounded by a bottom limiting noise threshold level and an upper limiting energy limit; and

controlling signaling power S according to

$$S = \int_{f \in \Omega} B - \frac{N(f)}{|H(f)|^2} df$$

where a region of integration Ω is defined by

$$\Omega = \left\{ f : \frac{N(f)}{|H(f)|^2} \le B \right\};$$

where $N(f)$ is a power spectral density of a noise;

$H(f)$ is a complex transfer function of the transmission channel;

B is an average input power constraint; and

S is an available signaling power.

14. (Currently amended) The method of claim 13 ~~14~~, wherein the step of:
segmenting bits includes utilizing multiple discrete prolate pulse functions.

15. (Cancelled)